COLLECTION MONETA – 176

DOCUMENTS AND STUDIES ON 19th c. MONETARY HISTORY

When Orient and Occident Meet

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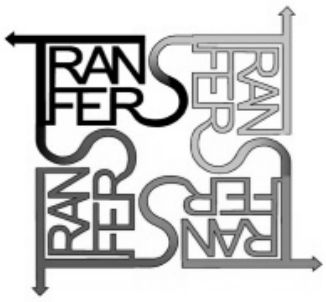

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Programme DAMIN

La Dépréciation de l'Argent Monétaire et les Relations Internationales

Silver Monetary Depreciation and International Relations (ANR 2011 BSH3 008 01)

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Introduction

Georges Depeyrot[1]

Cette nouvelle table ronde du programme DAMIN consacrée à *La Dépréciation de l'argent Monétaire et les Relations Internationales* marque une nouvelle étape dans l'avancée de nos recherches.

Après les rencontres à Paris (2012), Madrid et Paris (2013), cette réunion à Osaka permet de rassembler les chercheurs venus d'Europe et d'Asie sur le thème de la rencontre entre les mondes européen et asiatique.

Mondes éloignés, mondes séparés, mondes cependant proches et voisins, l'Europe (et son prolongement américain) et l'Asie se sont côtoyés de l'antiquité aux temps modernes. Les importations et exportations de denrées précieuses ou d'aromates, entre autres, sont mentionnées dans tous les textes. Ce fut principalement après les récits de Marco Polo (1254-1324) que l'Europe commença à réellement découvrir l'Asie.

Les améliorations techniques du quinzième siècle, puis les grandes expéditions maritimes qu'elles permirent, inclurent le monde asiatique dans les destinations, sinon habituelles, du moins accessibles aux aventuriers.

Après cette phase exploratoire, les contacts entre les deux zones n'ont cessé de se développer, jusqu'à la colonisation.

En matière monétaire, les relations entre les deux zones sont également marquées par ces phases d'attraction et de répulsion. L'Orient est souvent accusé de "corrompre" les valeurs ancestrales de l'Occident, avant de n'être perçu que comme un débouché économique des productions européennes. Ainsi, des périodes d'opposition, de séduction, d'exploitation ou de colonisation se sont succédées.

Au cours du dix-neuvième siècle, le numéraire s'intègre dans une relation coloniale. Il sert à importer – exporter les biens produits ou nécessaires aux pays occidentaux et orientaux.

Le système bimétallique tel qu'utilisé par l'Union Latine se double d'une division géographique et politique. Les pays les plus riches accèdent à l'or et l'utilisent dans leurs échanges tout en maintenant ou promouvant l'argent dans les colonies et les pays dépendants.

La dépréciation de l'argent amplifiait les déficits des balances commerciales entre les pays. Acheter au pays colonisateur contre de l'or (ou en référence à la valeur de l'or), lui vendre en recevant de l'argent donnait lieu à substantiels bénéfices pour le colonisateur.

L'Inde, nous l'avons vu dans les divers volumes publiés dans le cadre de cette recherche, a toujours cherché à sortir de cette relation inéquitable. La Chine, bien que non colonisée mais dotée d'un pouvoir politique faible, n'a pas su sortir de cette situation. Le Japon sortit en 1897 de cette situation pour emprunter (en or) à Londres.

C'est dire à quel point le rôle de l'Asie était important dans l'émergence de la globalisation monétaire du dix-neuvième siècle. C'est le sujet de notre table-ronde.

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The 19th century development in minting technology in Denmark and Japan - and monetary transitions in Denmark, Japan, and Bornholm

Michael Märcher[1]

Introduction

Coin production was industrialized in many countries in the 19th century. This was also the case in Denmark and Japan. Denmark was from the beginning of the century one of the first countries with a modern mechanized mint (Copenhagen), while the vital change took place in Japan from 1871, when a modern, significant mint was erected in Osaka.

The industrialization of coin production in both countries depended completely on the transfer of technology from other countries – for Japan primarily from Great Britain incl. Hong Kong, while in the Danish case primarily from Great Britain and Germany. No significant methods or machines related to coin production seems to be developed within the two countries in the 19th century.

This paper first deals briefly with the development in the two countries. The Danish case presents technological developments through most of the 19th century, while the Japanese case focuses on different aspects of the new Osaka mint in international perspective, primarily Danish and North European. Both the Danish development and the mint in Osaka are dealt with in more recent publications. Much of the general information about the mints, persons, processes is available in these works.[2]

Thereafter the paper pays attention to the main monetary effect of this development. The industrialized mints were preconditions for the creation of new, stable, and modern monetary systems. After a short presentation of the effects on the national level in first Japan and then Denmark, a short preliminary case study of parts of the monetary development on the Danish Isle Bornholm is included to give some perspective to the general national development.

Denmark[3]

Denmark had two mints during most of the 19th century, one situated in the capital Copenhagen (see fig.1 and 6 in the following article in this volume) and the other in the then second largest city of the realm, Altona, now a suburb of the German city of Hamburg (1771-1863, see fig. 3 in the following article).[4] The technological development of Danish coin production in the 19th century was characterized by the transition to mechanical operations and significantly enhanced use of machinery, and new methods in the production with substantial

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[1] The National Museum of Denmark, Middle Ages, Renaissance and Numismatics, Frederiksholms Kanal 12, 1220 Copenhagen K, Denmark, Michael.maercher@natmus.dk. This paper is written as part of a two-year post.doc.-project financed by The Carlsberg Foundation, concerning the monetary development in Bornholm from the 12th to the 19th century.

[2] Roy S. Hanashiro: *Thomas William Kinder and the Japanese Imperial Mint, 1868-1875*, Leiden 1999; Marina Kovalchuk & Georges Depeyrot (ed.): *Japan. Reports of the Imperial Mint (Osaka) I. (3rd-16th years of Meiji) (1870-1883)*, Collection Moneta 132, Wetteren 2012; Michael Märcher: *De kongelige møntsteder i Altona og København 1813-1873. Teknik og produktion*, Odense 2012; Meg Vivers: *An Irish Engineer*, Brisbane 2013. See also the contributions by Depeyrot and Vivers in this volume, which in contrast to this paper contain illustrations of the Osaka mint.

[3] Chapter based on Märcher 2012. The main transfers of minting technology to Denmark and some background information on Danish mints etc. are presented in the paper *The transfer of minting techniques to Denmark in the nineteenth century*, which is re-printed in this volume.

[4] From 1814 Norway and the Norwegian mint in Kongsberg were not part of the Danish king's realm.

quantitative and qualitative improvements. Horsepower, primarily used for rolling, was used until the rebuilding of the Copenhagen mint 1808-10 and the rebuilding of the Altona mint 1855-56, when it was replaced by steam power that also replaced the use of manual labour in several parts of the production.

The technology which had developed over several centuries was largely replaced by a new technology that significantly improved operations:

- In silver assaying, the cupellation test used since at least the middle ages was replaced in the 1840s by the Gay-Lussac method developed around 1830 in Paris.
- Iron moulds (fig. 1) 1810-56 replaced the sand moulds that had been used for centuries.
- In Copenhagen hand operated punching presses (fig. 2) were replaced by British steam driven punching presses (fig. 3) from Matthew Boulton's Soho Works[5] near Birmingham around 1810, while steam driven eccentric presses (fig. 4) from Darmstadt in Germany were introduced in the Altona mint 1855-56. The eccentric presses replaced the British punching presses in Copenhagen after the dismantling of the Altona mint in 1863.
- The old, slow, and work intensive piecewise weighing and scraping of blanks dominated by manual labour and file (fig. 5) was replaced by different hand planning devices (fig. 6) in the 1840s and by self-feeding steam driven planning machines and weighing machines in the 1870s. Both were based on technology developed in Germany and Austria (see fig.7 in the following article).
- Milling was a new element in the production introduced c. 1810-13 with the purchase of an entire mint for Copenhagen from Soho. The mint then started producing modern (industrialized) coins: completely round, a bit concave with low relief and heightened and protecting edges. The self-feeding British milling machine was copied at the mint in Altona c. 1813 (see fig. 4 in the following article), but both machines were replaced in the 1830-40s by machines from Germany. These machines were outdated in 1875, when the mint in Copenhagen bought a new milling machine built at the mint in Hamburg in Germany after British model (fig. 7).
- During the 19th century pickling with sulphuric acid replaced the blanching of blanks, which had been used at least since the middle ages (fig. 8).
- New die technology from Soho with use of convex dies and die copying around 1810-14 replaced important parts of the then used die manufacturing technology.
- Edge rimming had been used since the 17th century, but was changed radically in the 1820s as it became possible to edge rim during the striking of the blanks, since this was now done in a collar. The latter started around 1810-14 as a result of the mint purchase from Soho.
- Manually operated striking presses were used in Denmark since the 17th century (see fig. 2 in the following article). They were replaced in Copenhagen 1810 by steam driven self-feeding striking presses from Soho (see fig. 5 in the following article). In Altona the same happened in 1840-50s, when German self-feeding striking lever presses (Uhlhorn presses, fig. 9) were introduced. The highly efficient Uhlhorn presses were from the 1850-60s and for long into the 20th century the only coin striking presses in Denmark.

The melting and rolling basically took place in crucibles in wind ovens and in duo rolling mills (fig. 10) as in earlier periods, but their capacity and quality were increased due to

[5] See Richard Doty: *The Soho Mint & the Industrialization of Money*, London & Washington D.C. 1998.

improvements of especially crucibles and rolls. The mints' draw-benches for example became superfluous in the 1850-70s due to the improved rolling.

The mints' capacity was more than tripled from 1820 to 1855, and probably increased more than fivefold during the century. The increased production capacity combined with the improvements in quality made new developments and monetary policies possible.

Japan[6]

Japanese coin production very quickly changed with the purchase of the Hong Kong mint (1866-68)[7] and the establishing of the Osaka mint, which was in operation from 1871. Although the development was not completely identical to the Danish case, the results were generally the same: the instigation of modern coin production that created new possibilities.

At many European mints new technologies were introduced gradually, but both Denmark and Japan (the new Meiji government) and other in particular non-European mints took the large and significant step towards modern coin production by purchasing an entire new mint. The common motives for founding or re-building of mints were: 1) Ruined, unstable, or inferior monetary system, 2) fires, 3) new supplies of precious metals e.g. from new mines, or 4) new land areas to supply with coins. This was also the case in Denmark and Japan, who both had older, unstable, and ill-organised monetary systems with more or less inferior coins. Both needed to raise the general quality of their coins and to create a new, modern, and standardized monetary system.

In most European cases in the 19th century, a lot of information was gathered through study tours before re-building or founding of new mints. This was the case in Denmark, in particular in connection with the three major re-buildings (Copenhagen early 19th century and 1870s and Altona in the 1850s). This was not the case with the Osaka mint.[8] Several plans and reports related to the monetary system and coin types were made before the Japanese purchase, but more detailed examinations or study tours related to the technological aspects of the production were apparently not part of the process. The reason was probably that the Meiji government early in the decision-making process knew that the Hong Kong mint was about to close – and they must have been (made) aware of the design and (sufficient) quality of the coins produced by it.

Neither Japan nor Denmark had adequate technology or know-how before the mint purchases. Almost every tiny bit of the mints was imported, and no Danish or Japanese persons were familiar with the technology. In Osaka foreign specialists worked at the mint for several years, before Japanese staff took over. The most important person was the skilled British citizen Thomas William Kinder, who was hired as mint director (1871-75), since he had also served as director in Hong Kong, and he knew this and other mints. In Copenhagen, the mint was set up by men from Boulton's firm in Soho, and many instructions were undoubtedly given to the Danish mint workers during this relatively short period. The main training with the new technology, especially regarding the striking process and the steam engine, took place in Soho. The new mint master, a die engraver[9], and a key employee related to the engine and the larger works all spent significant time in Great Britain before construction began in Copenhagen. So the transition period with foreign workers in Copenhagen was very short compared to Osaka – and generally no foreigners were employed by the Danish government to work at the mint.

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[6] Chapter based on the works mentioned in note 2.

[7] The Hong Kong mint was manufactured in Great Britain. Equipment from Hong Kong was damaged in a fire in 1869 in Osaka, and replacements were purchased from Great Britain. About the Hong Kong mint see incl. references Georges Depeyrot: *Hong Kong. Rise and fall of the Hong Kong Mint (7 May 1866 – 25 April 1868)*, Collection Moneta 167, Wetteren 2013.

[8] For the bakufu's mint plans just before the Meiji Restoration, especially about machinery from France, see Hanashiro 1999, 29-33.

[9] Michael Märcher: G.V. Bauerts studierejse og ansættelsen af P.L. Giannelli, 1799-1801, *Nordisk Numismatisk Unions Medlemsblad*, 2011, 107-120.

The Osaka mint was placed on the banks of the Yodo River. It was important that sufficient amounts of water were available for production, and that transport to and from the mint was easy. At European mints in the 16th-18th century, and to some extent in the 19th century, it was also important to have access to water – not just for use in the production, which most works need, but to use water power in the mints, especially for rolling. Water power was rarely a theme in the second half of the 19th century, as steam engines were implemented almost everywhere. The new, great Osaka mint was also driven by steam, probably[10] two horizontal high-pressure engines each of 20 hp in the beginning. 40 hp was a fine force of power around 1870s and more than many other mints. But to a large mint as the Osaka mint 40 hp was not an impressive level of force – perhaps it was not even sufficient to run all the production lines/machines at the same time. The Copenhagen mint from c. 1808 had 14 hp and that was a lot in the first third of the 19th century. Still, the re-built Copenhagen mint from 1872-73 only had 22 hp – and the Altona mint operating 1856-63 had merely 16 hp. Most impressive was the 1881-82 re-built Royal Mint in London that went from 85 hp to c. 500 hp excl. the reserve engine. Throughout the 19th century the Royal Mint was often leading power-wise; it had 26 hp in 1810 and 60 hp in 1831. Other large mints as Calcutta for a long time operated with 74 hp, Vienna for a long time had 28 hp, and the mint in Birmingham had two engines each of 50 hp, while much smaller mints like Stockholm had 23 hp in 1857 and Helsinki had 25 hp in 1864. Several of the mentioned engines were manufactured in Great Britain, as was apparently also the case with the Osaka ones, but during the century production of steam engines took off in most countries, so it became more and more common that the engines were produced in the mints' home countries.

That the Osaka mint had a significant capacity is also obvious from, for example, the short description of the rolling department, which in 1874 amongst other equipment contained "6 pairs of 14 in. rolls, 4 pairs of 11 in. rolls, 2 pairs of Krupp's finishing rolls".[11] This was more than small, and probably also more than the medium-size, European mints, but less than the largest mints – again placing the Osaka mint in the higher end of the mint scale, but not among the largest. In Continental Europe it was relatively common to use rolls from Krupp in Essen, Germany, but competition existed. Initially, the Copenhagen mint used British rolls (e.g. Smith & Hawkes in Birmingham), but Krupp several times sent product samples – and from the 1850-60's the two Danish mints did use rolls from Krupp. During the 19th century the rolling process was divided from one or two phases into three separate phases including the first breaking-down-rolling and the last finishing-rolling. Three phases were probably the most common in the second half of the century, but still several mints used only two. Two draw-benches were also present in the Osaka rolling department in 1874, which must be due to the British influence. The improvement of mints' rolling works generally made draw-benches superfluous – this seems to have been the case in Germany already before the middle of the century, while draw-benches were still used in e.g. London, Paris, Stockholm, Denmark, and Utrecht. But in the last 30 years of the century, they were probably mainly used in mints heavily influenced by British technology.

The number and types of coin striking presses also places the Osaka mint as a mint with above average capacity – and several other types of mint technology, equipment, or departments at the Osaka mint point in this direction.[12] The erection at the Osaka mint of works for copper and iron casting and gold and silver refining, as well as plants for blue vitriol, nitric acid, and sulphuric acid also clearly underlines the mint's significance – and the wish to be self-sufficient and reduce costly imports from Europe. The works were in other words almost a necessity due to the lack of such facilities in Japan, but still the mint had much more of these types of facilities

[10] The Hong Kong apparently had one 60 hp engine, see Hanashiro 1999, 41 and Vivers 2013, 87-89 about the engines.

[11] Kovalchuk & Depeyrot 2012, 54.

[12] For further examples of technology at the Osaka mint and for comparisons of minting technology in different countries, especially Denmark with other mints in Northern Europe see Kovalchuk & Depeyrot 2012 (also later volumes on Osaka: Collection Moneta nos. 143-144) and Märcher 2012.

than was found on almost all other mints in the world, which normally purchased, regularly through import, all their needed materials.

In 1874, the original six British striking presses from the Hong Kong mint were in the Osaka mint's copper coining room. The copper coinage was in relation to quality less prioritised than the gold and silver coinage, which were struck by ten Uhlhorn (German) presses and two Thonnelier (French) presses. The mint had imported state of the art self-feeding coin striking machinery that without much manual labour and only little steam power produced the best coins possible in huge quantities. The Uhlhorn presses were extremely well-functioning and almost never broke down. As mentioned, original Uhlhorn machines from the 1840-50s were e.g. used in Copenhagen up to the 1950-60s.

In addition to the important and in many ways revolutionising lever coin striking presses the mint in 1874 constructed three presses for the copper coinage. This was an important development even though the lever press technology was imported technology. The mint started copying – and generally utilizing – the transferred technology. Another example is the manufacturing of crucibles, which is a key material in coin production. Mint director "Kinder found that the Japanese did not possess the skills for making crucibles … Concerned that such an important item had to be imported from abroad, he decided to examine the possibility of manufacturing crucibles in Japan. He walked the mountains behind Kobe and found suitable material for producing crucibles. This was the origin of manufacturing crucibles in Japan."[13] As the mint expanded in size with different works etc., even when it had been in operation for only a short period, it became more and more self-sufficient with regards to almost everything e.g. machinery and materials – and needed foreign technology or experts less and less.

The transfer of technology to the mint was vital for the monetary development, but the importance of the technology transfers was not limited to coin production. The mint was a technological forerunner. Much technology and many types of machines and equipment had their Japanese debut at the mint and then spread to other parts of Japanese society. This was economically beneficial as for example acid production, metal refining, and double-entry bookkeeping were originally imported for use in the mint, but eventually led to acid export to China, better use of raw materials, and improved accounting. Gas lighting and rails were two benefits introduced to the city of Osaka as a result of the technology and works implemented or built at the mint.

Mints were also technological forerunners in many other countries, but in Europe on a smaller scale and generally limited to new technologies, methods, or machines related to chemistry and metal working. In Denmark, the second steam engine was at work at the mint in Copenhagen from c. 1808. This was also the time and place for the first self-feeding metal working machines, the first lathe, and some other machinery in Denmark. Eccentric presses were very important during the industrial age – as they are in production today. The first ones in the Danish realm seem to have been four machines manufactured in Germany and installed at the re-built Altona mint 1855-56.

Effects of industrialized coin production

The massive increase in the coin production's quality and quantity due to the industrialized mints led to new possibilities and were everywhere put to use in the monetary policy. The mints were preconditions for the creation of the new, stable, and modern monetary systems that were created in the 19th century. As technical infra-structure installations the mints were part of the technology based transformation / modernization / nation- / state-building directed to some degree by the new and often more centralised governments of the Nation-States of the 19th century. For Japan, Hanashiro puts it like this: "The Mint also was an important part of the Meiji government's plan to forge a centralized government. An important

[13] Hanashiro 1999, 165.

derivative of the Mint project was that it helped to disseminate Western technology and management practices to various parts of Japan."[14] New, stable, common, and uniform monetary systems were of course vital to the development of banking, trade, and finance systems. But the importance was not limited to these economic sectors of society and the technological aspects. The stable and common monetary system with widespread use of coinage was – like common language – a uniting factor; it brought different parts of society closer together both in the local, regional, and national level and between urban and rural areas.[15]

In his interesting book *The Making of National Money* Helleiner[16] points to two structural preconditions for the development of territorial currencies in the 19th century: the industrialized coin production and the Nation-States. This analysis fits very well with the earlier chapters and with the 19th century monetary development in Japan and Denmark.

Japan[17]

Before the monetary reform of 1871 and the opening of the new mint the same year, monetary matters in Japan were chaotic with lack of stability and decentralized and uncoordinated issuing of many types of means of exchange. A report on Japanese monetary matters delivered to the Meiji government early in 1868 concluded "that the Japanese coins were of poor quality and lacked uniformity and were thus inferior to foreign coins."[18] Facing and accepting "the urgent need for a new currency system acceptable to Western nations [the government decided] that a Western-style mint was required".[19] The two main purposes of the mint were clearly stated: "to supply Japan with sufficient coins and to facilitate trade."[20] The reform of 1871 created the yen and made it the standard unit of the new monetary system. It should function as trade coin as well, and it would hopefully take on competition with the wide-spread and well-known Mexican dollar. Gold, silver, and copper coins were legal tender according to the reform.

Due to the efficient mint high quality coins were produced in large quantities. They were perfectly round, had modern protective features, and were uniform. This was – at least in the 1880s – internationally acknowledged. Enormous amounts were produced, and the results appeared promptly. The monetary policy (incl. the mint and the reform) was a success, and it transformed Japanese society. The amount of new Japanese coins circulating in Japan continued to rise, and in the late 1890s the Mexican dollar was almost completely eliminated from Japanese circulation. The large-scale production of small coins and the more widespread use of coins are vital developments in the 19th century monetary modernization that also took place in Japan. Hundreds of thousands of copper coins were often produced on a weekly basis; first to meet the incredible demand created by the reform, which "will require many years"[21] of production, and thereafter to maintain and develop the circulation that continuously needed new supplies.

Kovalchuk & Depeyrot sum up the economic and political importance of the modern large-scale production of copper small coins in Japan very well: "First … a large and abundant monetary stock of small coins, [was] very important for the daily use of the currency. It was clearly the first step in the deep economic transformation of the society [underlined by present author]. Second, the creation of a bronze stock aimed to reduce the use of the notes which served as a daily means of trade. The issues of these coins were facilitated by the enormous

[14] Hanashiro 1999, 176.
[15] Märcher 2012.
[16] Eric Helleiner: *The Making of National Money. Territorial Currencies in Historical Perspective*, Ithaca 2003, chapter 2.
[17] Chapter based on Hanashiro 1999 and Kovalchuk & Depeyrot 2012.
[18] Hanashiro 1999, 34.
[19] Hanashiro 1999, 176.
[20] Hanashiro 1999, 35.
[21] Kovalchuk & Depeyrot 2012, 50.

number of cash coins produced since centuries by the shoguns which the mints re-melted and re-issued. … This increase of petty coins came as a consequence of a political decision based on social and economic motivations, such as desire of the Imperial government to demonstrate its importance to the public and to erase the last remains of the Tokugawa Shogunate."[22]

Denmark

The general monetary development and effects of the industrialized mints in Denmark c. 1810-1870s can be summarized in this way[23]:

From the Napoleonic Wars to major reforms in the 1870s, Denmark went from state bankruptcy and a ruined, unstable, old, and silver based monetary system to a new, modern, uniform, and metric system based on a newly established Scandinavian gold standard. The stable monetary system was based on a major monetary reform in 1813, and it was established through crisis, recession, and gradually growing prosperity from around 1830. Thereafter the monetary policy focused on the creation of a common and uniform system for the entire realm: the kingdom of Denmark and the duchies of Schleswig and Holstein. The Schleswig-Holstein Question made this almost impossible, but serious work on this monetary goal was undertaken both before and after the First Schleswig War of 1848-50. A comprehensive monetary reform of 1854 was vital. The common monetary system for both Denmark and the duchies was more or less reached around c. 1860, but the separation of the kingdom and the duchies in 1864 changed the entire scene. From then on the main monetary problem in the small kingdom of Denmark was the changing ratio between gold and silver, which led to the successful changes in the 1870s that were decided in cooperation with Norway and Sweden.

The means and conditions for the development 1813-73 were manifold: a hard stabilizing policy of revaluation 1813-35 with some special conditions for the duchies, the loss of Norway in 1814 and of the duchies in 1864, economic prosperity c. 1830-70s, the government's policy of state-building, a central bank with monopoly on note issuing, major monetary reforms with massive withdrawals and re-coinages, well-located industrialized mints with sufficient capacity, and huge markets for money and metals in Hamburg and London.

The turning point in the use of copper coins was the decade 1810-1819, when large-scale production of high-quality copper small coins with high and low denominations began, while no silver small coins were produced and old ones were withdrawn or had disappeared from circulation during the Napoleonic Wars. The supplies of small coins were – probably for the first time ever – almost sufficient c. 1815-1830 due to economic development, monetary policy, and the newly industrialized coin production.

The next major change in Danish base metal coinage was the introduction of bronze coinage in the second half of the 1850s. Bronze coinage quickly replaced copper coinage as part of an important monetary reform of 1854. The circulation of small coins was supplemented with more than 15 million bronze coins 1856-1864, and for the first time ever the stock of base metal small coins was sufficient to meet the continuing and increasing demands. This significant development was a prerequisite for a change towards modern small coins production at the mint in Copenhagen from the second half of the 1860s with annual production to maintain a sufficient supply of small coins. These developments were conducive to monetary stability and economic prosperity.

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[22] Kovalchuk & Depeyrot 2012, 9f.

[23] Information about the development is available e.g. in Märcher 2012 and in these two papers published within the DAMIN program, the summary stems from them: Michael Märcher: Coins, metals, and reforms: A survey of Danish monetary history 1813-1873, in Georges Depeyrot (ed.): *Moneys and Economies during 19th Century (from Europe to Asia)*, Collection Moneta vol. 139, Wetteren, 77-95, and Michael Märcher: Bronze and copper coins in 19th century Denmark – and found at Koldekilde on Bornholm, in Georges Depeyrot (ed.): *Three Conferences on International Monetary History*, Collection Moneta 156, Wetteren, 103-122.

Bornholm

The general transition of rural Denmark to an almost full scale monetary economy is normally placed c. 1750-1850, and it is closely related to the agrarian reforms of the time, which included the major changes of the enclosure movement and the conversion into freehold tenure. During these processes more and more taxes, rates, and dues were to be paid in money (coins and bank notes) rather than in kind. This was possible due to the industrialized coin production, and it was wanted by the state that for example needed cash/silver. Around 1850-60s few payments were still made in kind, while a more even rural distribution between the use of kind and money existed around 1750.[24]

The development towards almost full monetary economy with sufficient supplies of coins did not take place at the same speed all over the country, and it was not a development without setbacks. A short preliminary case study of the monetary development of the Danish isle Bornholm in the Baltic Sea can shed some light on these aspects. Bornholm is not chosen due to its representativeness; on the contrary the isle was probably the last place or one of the last places in Denmark to start and complete the transition. The peasants of Bornholm continued to pay some taxes especially manorial dues in kind, primarily in butter, into the second half of the 19th century.

Villages, the communal system of agriculture[25], the adscription system, and the typical Danish system of estates did not exist in Bornholm, and Bornholm was not included in the Danish land register of the 1680s. A sufficient land register of Bornholm was not made until the 1840s, so while the exchange of strip holdings for one compact holding began in the 18th century in most of Denmark, it was well into the 19th century before land exchanges started in Bornholm. Exchange of the common outlying fields did not take off before 1842 and lasted to 1866.[26]

These late agrarian developments were probably some of the reasons for the late transition to monetary economy in Bornholm. Also, Bornholm was an isle far to the east in the Baltic compared to the rest of Denmark. It never had its own mint, so the coin circulation on the isle depended on supplies from outside the isle, and of course money came to the isle through exports, direct money supplies of coins and notes, public payments for example salaries, payments made in Bornholm by non-local people etc.

Monetary matters in Denmark during the Napoleonic Wars were special and ended in a big, fundamental monetary reform in 1813, and focus is here on the period from 1813 to the 1860s. The monetary reform meant that a large part of the circulating coins and notes had to be withdrawn and replaced. In the years after the reform, Bornholm had insufficient supplies of both small coins and larger standard (silver) coins. The monetary circulation can be separated into at least two different circuits: small coins for small trade, some taxes etc. and larger coins and notes used for example salaries, taxes, and substantial trade. And the direct public money supplies to Bornholm follow this differentiation. In 1815-16, Bornholm's county's civil administrator (amtmand) a couple of times successfully asked the government in Copenhagen to send new supplies. Lots of the new small copper coins were needed in Bornholm, and the lack of coins was causing problems for the collection of taxes. The county administrator asked for 500 rixdollars in small coins in both 1815 and 1816, but in December 1816 he also needed much larger sums in notes. He only had c. 4,000 rixdollars at his disposal, and they would all be used on the many salaries, pensions etc. that were to be paid at the end of the year. He wanted c. 34,000 rixdollars from Copenhagen, since c. 30,000 rixdollars to the commandant (the

[24] Sigurd Jensen: *Fra Patriarkalisme til Pengeøkonomi*, Copenhagen 1950.

[25] But some common fields etc. did exist; the outlying fields and other areas e.g. clay pits and watering places.

[26] Anders Holm Rasmussen: Det bornholmske landbosamfund i 1700-tallet, *Bornholmske Samlinger*, 1988, 9-20; Flemming Beyer: Historisk tid, in Jytte Nykjær Iversen (ed.): *Kulturhistoriske interesseområder*, Rønne 1983, 43-96.

county's military administrator) was assigned to him and he needed almost 4,000 in June, when he had to pay people the interest yielded by royal bonds.[27]

Large parts of the money supplies from Copenhagen through trade, salaries etc. went into the money circulation of Bornholm and the very small isles (Christiansø and Frederiksø) north of it, but it was not enough. Insufficient supply of quality coins and notes were a general phenomenon in Denmark in the 1810s. The worst part of the post-war economic crisis seemed to be over around 1816, and around 1817-18 optimism dominated the economic and monetary policy, so in 1818 some Danish taxes on property were changed from payment in grain to payment in money (silver). The new tax quickly turned out to be unrealistically harsh, primarily due to falling grain prices, and some easing of the tax was implemented. From 1820 it became possible to pay part of the tax in grain. This was clearly a temporary setback in the transition towards full monetary economy, but it was important to the general transformation of society that the peasants could dispose of their grain at a reasonable price and pay taxes.[28] The setback lasted until 1830, it was probably changed due to large-scale Danish agricultural export, especially grain to Great Britain that took off around 1830 and led to a very fortunate economic development.

The peasants' grain sales and financial situation of course affected the rural monetary economy – and the development in the money supply of course affected the peasants. This became obvious in Bornholm in the early 1830s, where the lack of coins seems to be much more severe than in most parts of Denmark. In 1833 the lack of coins was apparently at one of its heights in Bornholm. Peasants in at least seven parishes in Bornholm (Klemensker, Rutsker, Olsker, Rø, Vestermarie, Knudsker, and Pedersker) wrote to the king and applied for permission to pay taxes etc. in kind (grain) instead of money. They wished for this exemption for some years, and it was due to the complete lack of money in Bornholm. The lack of money had been severe for several years, but now it was worse than ever. It was almost impossible for the peasants to obtain any money. An expense of just a few rixdollars was very hard to pay. It took much time and all your credibility to borrow the few necessary coins, and many people did not have the connections or credibility to borrow money at all. The lack of money deeply affected the economy of the island. The peasants did not have any money since this year they could not sell their grain to the isle's merchants. Only some of the merchants wanted to buy the grain, but they were also lacking the necessary means of payment, so they offered a much lower price than normal for the grain – and at least one of the relatively few merchants in Bornholm offered to pay the low price half in money and half in goods. This was not a solution that the peasants could approve. They needed money and a reasonable price to pay tax and avoid economic ruin.[29]

Bornholm's civil county administrator wrote to the government in Copenhagen and confirmed the complete lack of coins on the isle in general (peasants and merchants), and that the peasants could not sell their grain even at a very low price. He underlined that the peasants were not exaggerating about the lack of money and the problems caused by it. He had himself several times told the government about the problem, and he had problems collecting taxes in money. He explains that the previous years' development within grain trade, fishing etc. had given the merchants a lower income and thereby caused their lack of money. He finally urged that the peasants needed to be allowed to pay in kind, and that a type of credit possibility should be created. Apparently the applications were unsuccessful; the rules should be the same all over – a general exemption regarding the different taxes etc. could of course not be given.[30] This was bad news to Bornholm, but how it affected the citizens and how – if – they managed to pay taxes is not clarified. The problems in Bornholm underscore the importance of the transformation towards full monetary economy to the state, but it also reveals the problems involved. The government's rejection can be understood as part of its state-building-policy of

[27] The Danish National Archives, Rentekammeret, Journaler ang. Bornholm, 1815-16.
[28] Jensen 1950, especially 110f.
[29] The Danish National Archives, Rentekammeret, Journalsager ang. Bornholm, 1833.
[30] Ibid.

the time, and during the 19th century Bornholm became more and more integrated into the rest of the Danish realm, for example due to the political and technological development with democracy and new types of transportation and communication.

Bornholm seems to have had insufficient amounts of both small and larger coins for a couple of decades after 1833. Problems were eased in the middle of the century as credit possibilities and the general economy improved. Export of raw materials, agricultural and manufactured products grew and brought money to the isle. As mentioned, the circulation of small coins were in Denmark generally sufficient from the 1850-60s. This was probably also the case with Bornholm in the third quarter of the century, and the isle appears to have been the last or one of the latest places in Denmark with a full monetary economy. However, the transformation seems to have been a bit more difficult on the isle than in most other places. The peasants in Bornholm continued to pay some of their taxes (primarily or only the manorial dues) in kind after the introduction of democracy in Denmark 1848 and the monetary reform of 1854, but the use of payments in kind was significantly reduced in the middle of the century in all of Denmark incl. Bornholm, and 1863 seems to be the last year with some minor tax payments in kind (butter, rye, and barley) in Bornholm.[31]

This small excursus to Bornholm shows that it is also important to study the local and regional effects of the international and national developments and decision-making. The smaller local and regional stories clearly interact with and add perspective to the larger coarser and more main-stream national and global stories.

Summary

Coin production in Denmark and Japan was fully industrialized in the 19th century. This was in these two countries a very quick shift, since they imported complete mints incl. all the necessary technology from abroad, especially British technology. The new mint in Copenhagen from c. 1808 was one of the most advanced mints in the world in the first third of the century, while the new Osaka mint from 1871, based on the dismantled Hong Kong mint and with several works connected to it, was one of the world's larger mints. The transfers of technology to the new mints were significant, and the mints were technological forerunners, especially the Osaka mint that helped spread modern technology to other parts of Japanese society.

The industrialization led to a massive increase in the coin production's quality and quantity, which were put to use in the monetary policy as part of the nation-/state building policies of the 19th century. The mints in both Denmark and Japan contributed to the modernization of society, especially by reforming old monetary systems into modern systems with stable, high-quality, uniform, and common coins. With the new mints it was possible to produce sufficient amounts of quality coins, so rural areas could be fully integrated into the general monetary economy. The process away from payments in kind took time and reforms, and it was not without setbacks for example in Denmark in the 1820s. On the isle Bornholm, the lack of money was an almost permanent problem until the third quarter of the century, and some manorial dues were paid in kind until 1863.

[31] The Danish National Archives, Bornholms Amtstue, Hovedbog for ydningen, sædafgift og landgildesmør, 1860-1863.

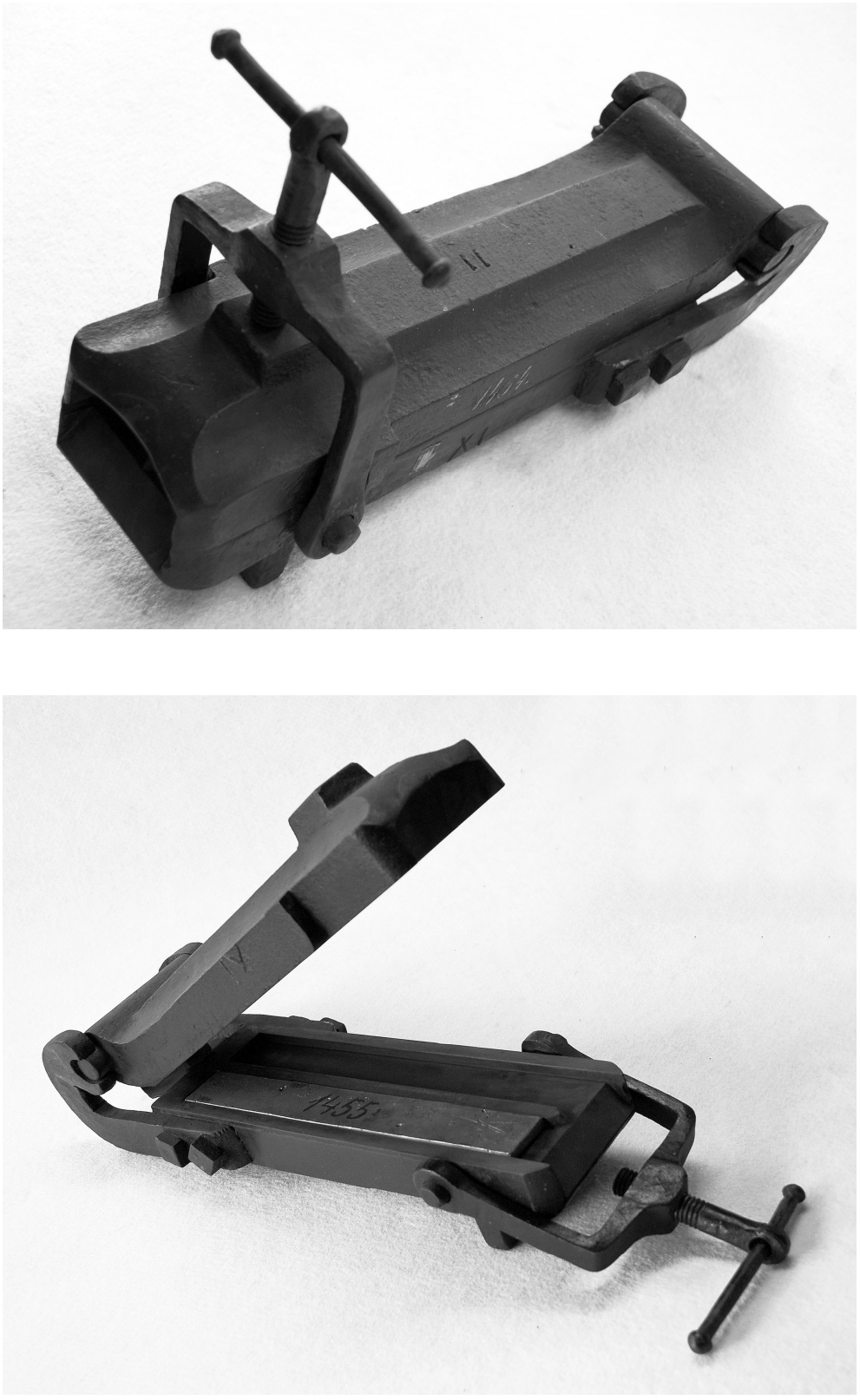

Fig. 1: Iron mould for casting of two strips. From the mint in Copenhagen before 1889. The Danish Museum of Science and Technology.

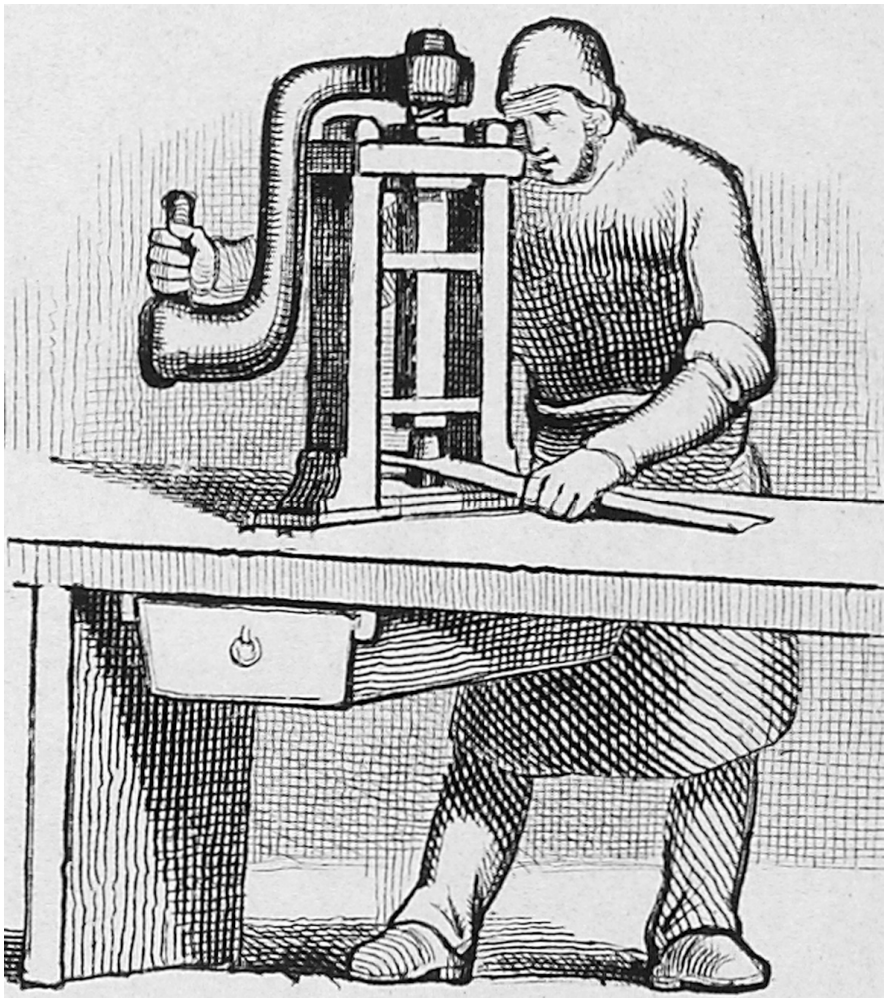

Fig. 2: Hand operated punching press c. 1830-40s. Drawing from receipt used at the mint in Altona. The Danish National Archives.

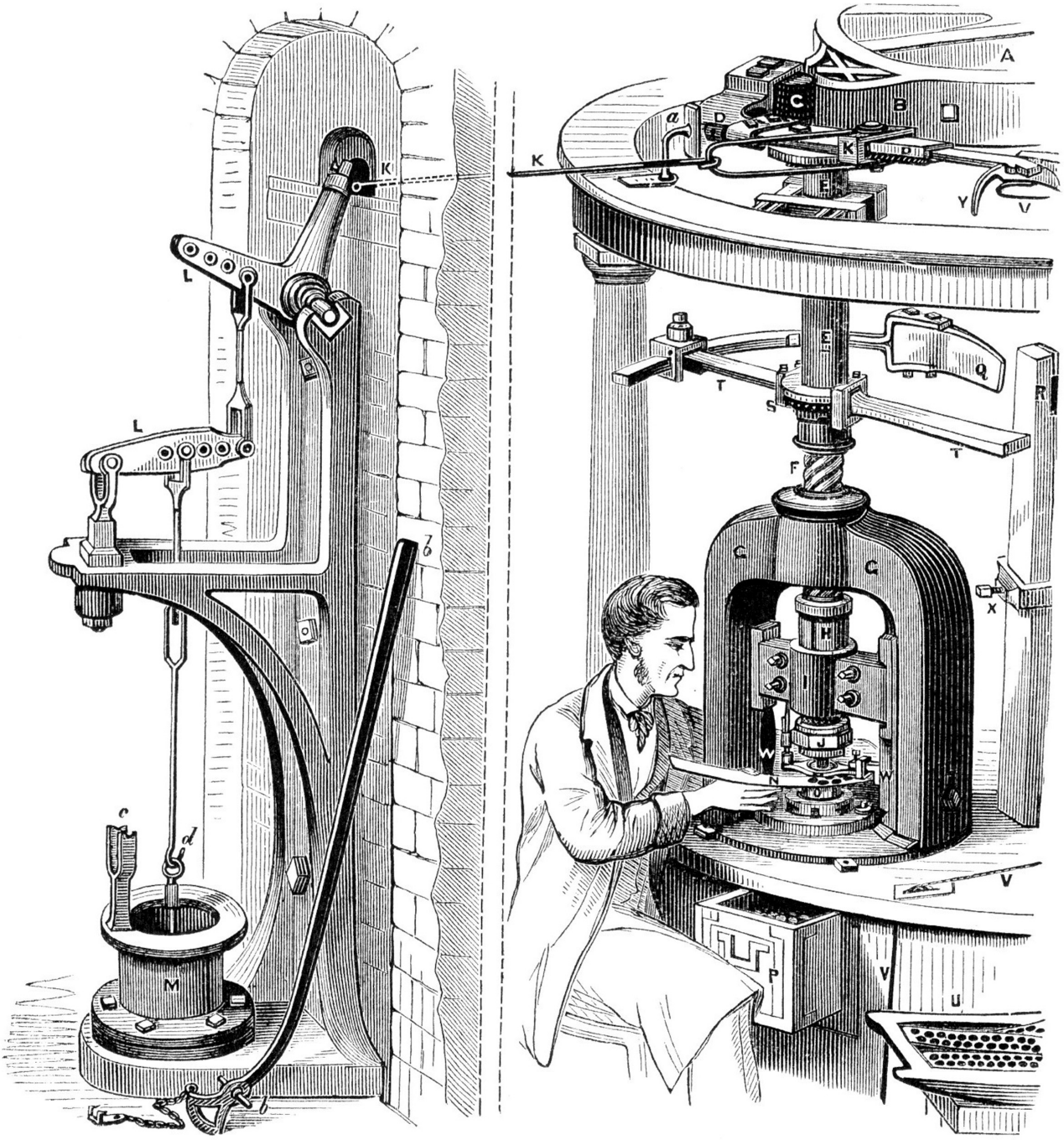

Fig. 3: Boulton's steam driven punching presses at the Royal Mint in London from 1810 and onwards.

The same type of machinery was implemented in Copenhagen c. 1808.

G.F: Ansell: *The Royal Mint*, London 1870.

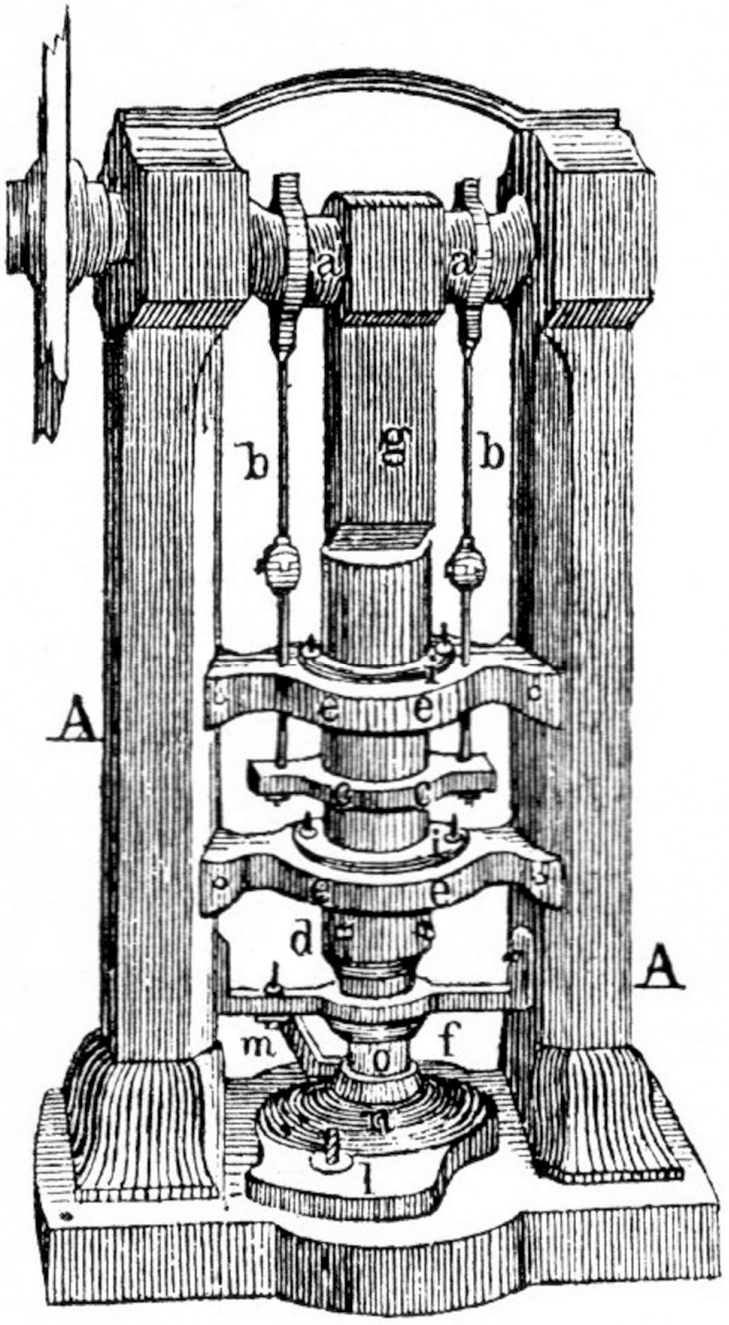

Fig. 4: The four new eccentric presses installed at the Altona mint in the 1850s were probably of this general type. E. Schlösser: *Die Münztechnik*, Hannover 1884.

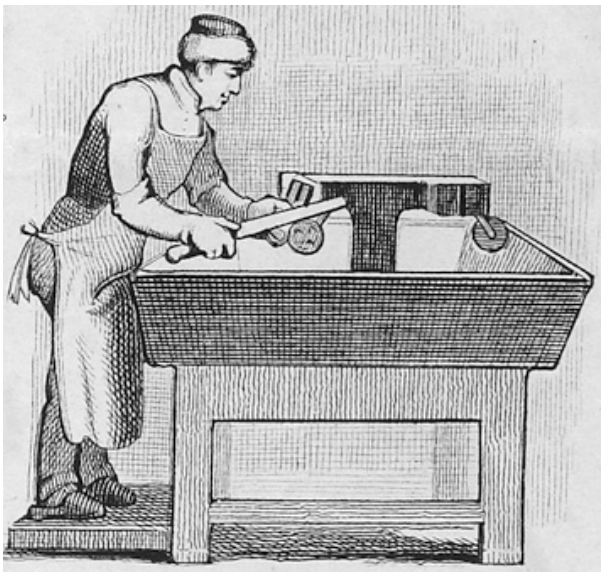

Fig. 5: Weight adjustment of a single blank using a file c. 1830-40s.
Drawing from receipt used at the mint in Altona. The Danish National Archives.

Fig. 6: Hand operated planning device used at the mint in Copenhagen from the middle or second half of the 19th century. An overweight blank was placed in the round container and then planed by a blade
(not visible on the picture) as the handle was moved from side to side.
The Danish Museum of Science and Technology.

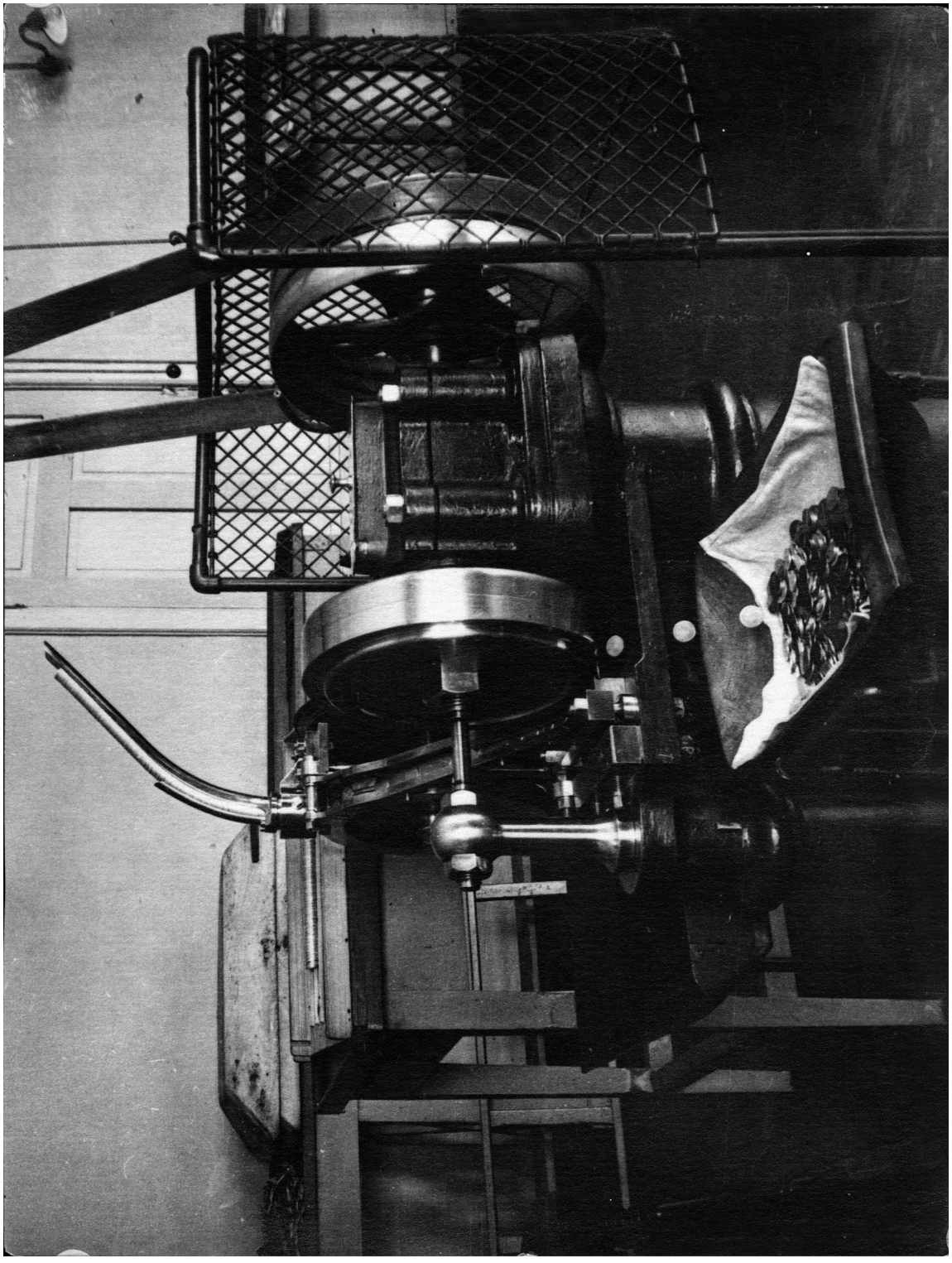

Fig. 7: Probably the milling machine built at the mint in Hamburg 1875.
Early 20th century privately-owned photo from the mint in Copenhagen.

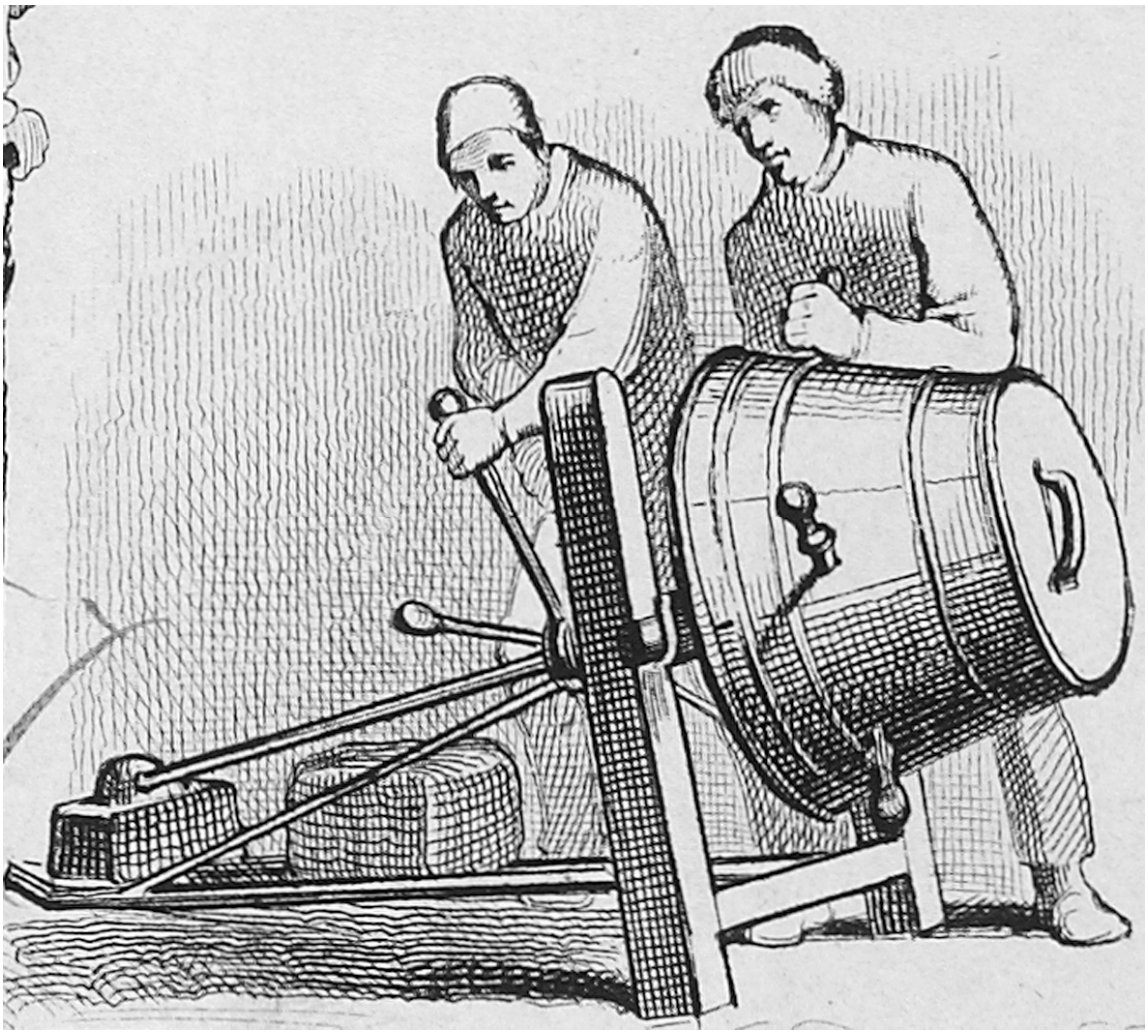

Fig. 8: Cleaning of blanks in hand operated rotating drum c. 1830-40s.
Drawing from receipt used at the mint in Altona. The Danish National Archives.

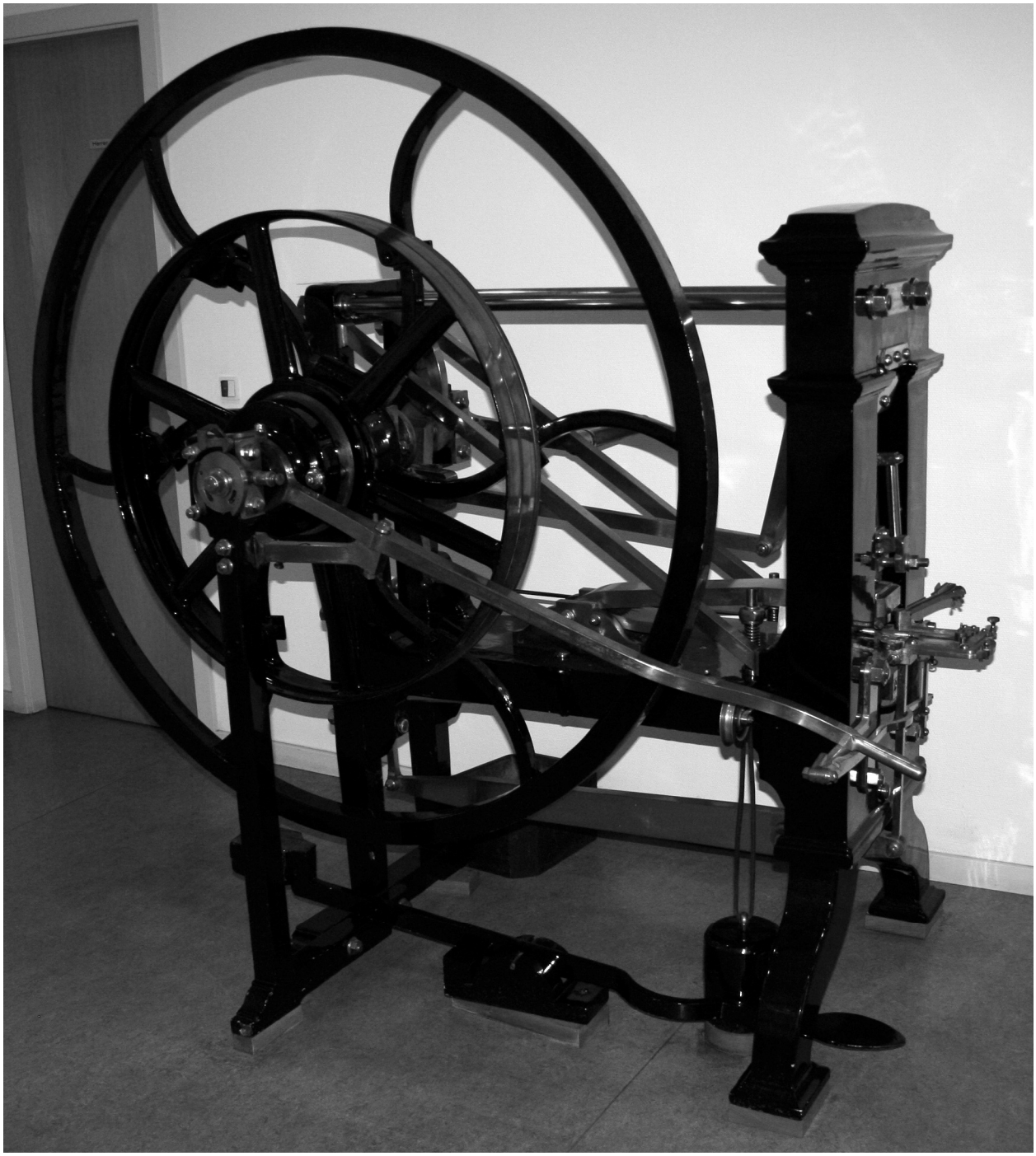

Fig. 9: The Uhlhorn lever press revolutionized coin striking. Five of these almost unbreakable wonder machines came to the mints in Altona and Copenhagen in the 1840-50s.
This is the second, which came to Altona in 1842. After the dismantling of this mint in 1863 it was installed in Copenhagen and used till the middle of the 20th century.
The National Museum of Denmark.

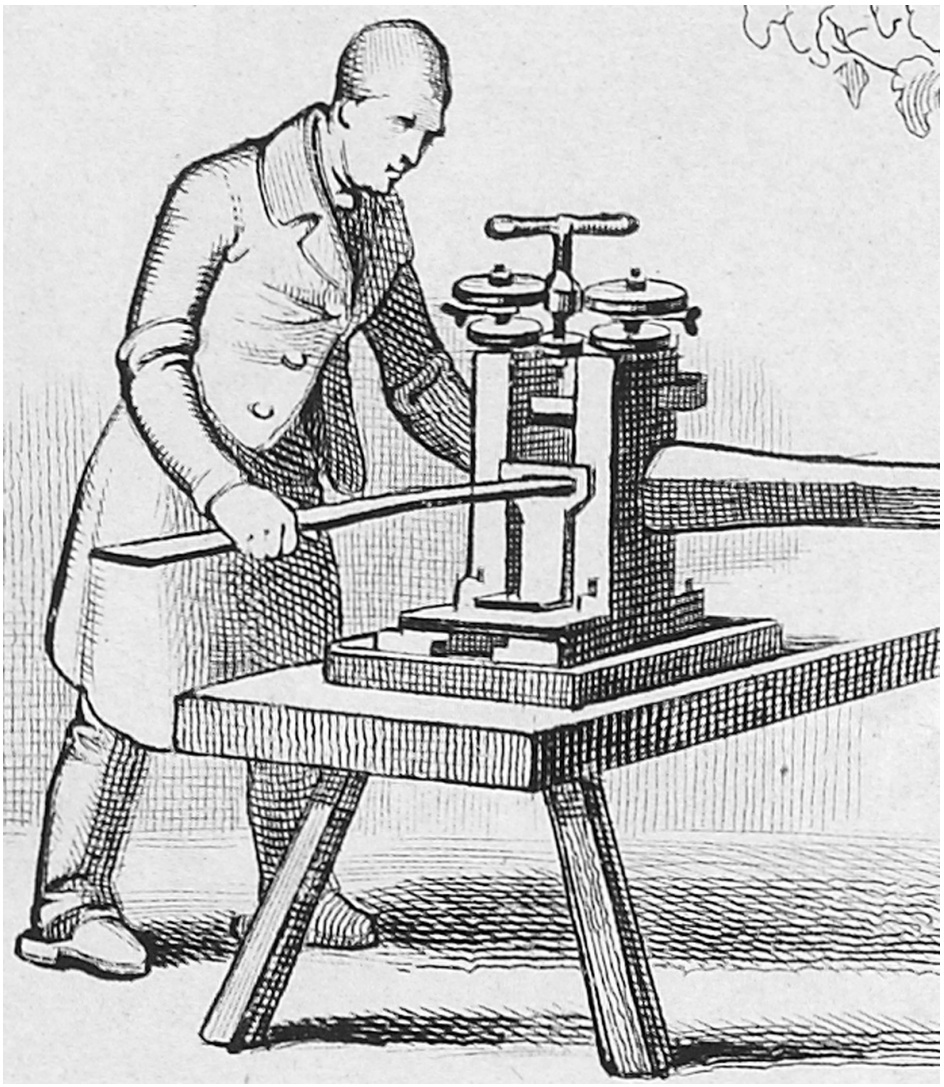

Fig. 10: Strip rolling on a horizontal duo rolling mill c. 1830-40s.
Drawing from receipt used at the mint in Altona. The Danish National Archives.

Contents

The aim of the program is to analyze the question of the rise and fall of the bimetallism and the question of the depreciation of silver in the nineteenth century. This analyze includes the important question of the role of Asia and especially of China and Japan in the silver question. A large place is given to the questions of coin production, monetary unifications with the emergence of common currencies (cf. Latin Union in Europe, US and Mexican Dollar, Yen, etc.) in a process of globalization of the monetary market, including the question of the shift to the gold standard. The period concerned is mainly the XIXth century, in a large acceptance.

The DAMIN program (2012-2015), supports and encourages several actions such as publication, republication of the main basic documentation (International Monetary Conferences, Reports of silver committees, etc.), especially in the series *Documents and Studies on 19th c. Monetary History*. Translations of documents from non-European languages are also parts of the program. Of course, analyses and elaborations of new interpretation are the final goal of the program; comparative studies with other periods of monetary globalization are welcome.

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